



Wind Power Inverter
WINDY BOY 3300 / 3800
Installation Manual

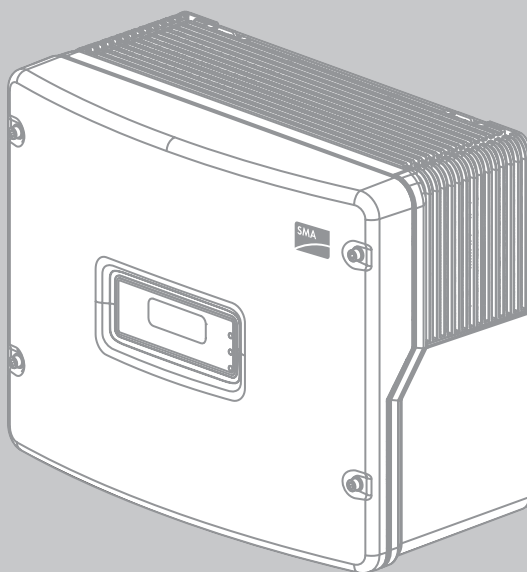


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1 Information on this Manual

1.1 Validity

This manual describes the mounting, installation, commissioning, maintenance and troubleshooting procedures for the following SMA inverters:

- Windy Boy 3300 (WB 3300, WB 3300-11, WB 3300-IT)
- Windy Boy 3800 (WB 3800, WB 3800-11, WB 3800-IT)

Please store this manual where it will be accessible at all times.

1.2 Target Audience

This manual is for the use of electrically skilled persons. The tasks described in this manual may be performed by electrically skilled persons only.






1.3 Additional Information

You will find further information on special topics, such as the design of a miniature circuit-breaker or the description of the operating parameters, in the download area at www.SMA.de/en.

Please refer to the user manual provided for detailed information on operating the inverter.

1.4 Symbols Used

The following types of safety precautions and general information are used in this manual:

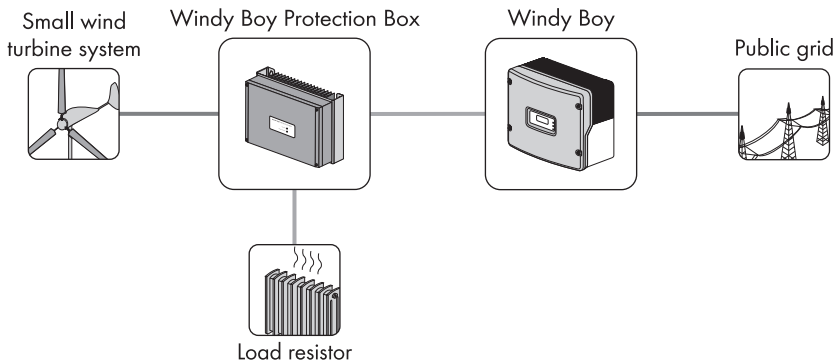
	DANGER! DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.
	WARNING! WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.
	CAUTION! CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
	NOTICE! NOTICE indicates a situation which, if not avoided, could result in property damage.
	Information Information provides tips that are valuable for the optimal installation and operation of the product. <input checked="" type="checkbox"/> This symbol indicates the result of an action.

2 Safety

2.1 Intended Use

The Windy Boy is a wind power inverter, which converts the rectified current generated by a small wind turbine system into AC current and feeds this energy into the electricity grid, domestic network or the Sunny Island system.

Principle of a small wind turbine system with Windy Boy



In addition, the Windy Boy can be used as inverter for energy converters based on permanent magnet generators (hydro-power systems, combined heat and power plants, diesel generators, etc.).

The manufacturer of the small wind turbine system or generator must have approved his plant for operation with this Windy Boy.

For safety reasons, it is not permitted to modify the product or install components that are not explicitly recommended or distributed by SMA Solar Technology AG.

When designing the PV plant, ensure that the permitted operating range of all components is complied with at all times. Moreover, make sure that appropriate protective measures are in place to ensure that the maximum permissible input voltage is not exceeded. SMA Solar Technology AG offers you the necessary components, such as the Windy Boy Protection Box (overvoltage protection for wind power inverters including the rectifier).

2.2 Safety Precautions



DANGER!

Electric shock due to high voltages in the inverter when connecting the device. Death or serious injuries.

- All work on the inverter must be carried out by a trained electrically skilled person only.
- Work on the inverter should only be carried out as described in this manual.
- All safety precautions listed here must be observed.



CAUTION!

Risk of burns through contact with the hot enclosure during operation. Burns to the palm of the hand.

- Do not touch the inverter enclosure during operation.








Problems while performing the described activities

If you have problems while performing any of the activities described in this manual, please contact SMA Solar Technology AG (see Section 13 "Contact" (page 77)).

2.3 Explanation of Symbols

This section gives an explanation of all the symbols found on the inverter and on the type label.











2.3.1 Symbols on the Inverter

Symbol	Explanation
	Operation display Indicates the operating state of the inverter.
	Earth fault or varistor defective Read Section 9.3 "Red LED is Permanently On" (page 62).
	Fault or disturbance. Read Section 9 "Troubleshooting" (page 56).
	You can operate the display by tapping the enclosure lid. <ul style="list-style-type: none"> • Single tap: the backlight switches on or the display scrolls to the next display message. • Double tap in quick succession*: The inverter shows the display messages from the start-up phase again (see Section 6.2 "Display Messages During the Start-up Phase" (page 40)).
	QR-Code ^{***} for SMA bonus programme You will find information on the SMA bonus programme at www.SMA-Bonus.com .

* This function is valid as of firmware version 4.00.

** QR-Code is a registered trademark of DENSO WAVE INCORPORATED.

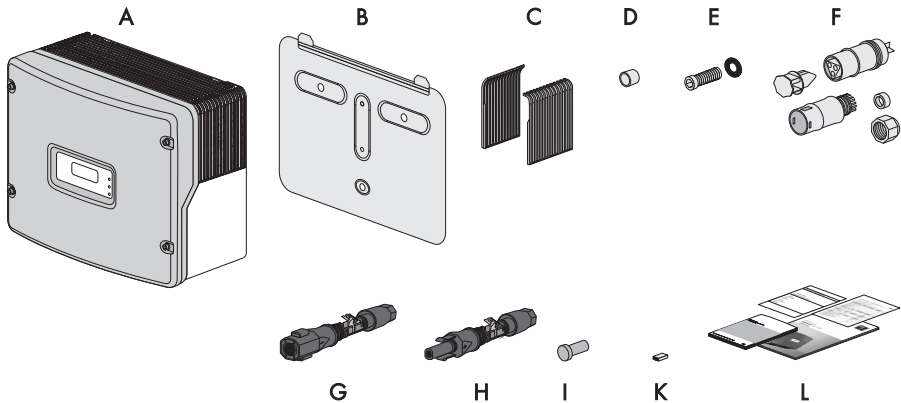
2.3.2 Symbols on the Type Label

Symbol	Explanation
	Beware of dangerous electrical voltage. The inverter operates at high voltages. All work on the inverter must be carried out by a trained electrically skilled person only.
	Beware of hot surface. The inverter can become hot during operation. Avoid contact during operation.
	Observe all documentation that accompanies the inverter.
	The inverter must not be disposed of together with the household waste. For more information on disposal, see Section 10.4 "Disposing of the inverter" (page 68).
	CE marking The inverter complies with the requirements of the applicable EC directives.
	RAL quality mark for solar products The inverter complies with the requirements of the German Institute for Quality Assurance and Labelling.
	The inverter has a transformer.
	Direct current (DC)
	Alternating current (AC)
IP65	The inverter is protected against dust intrusion and water jets from any angle.
	The inverter is suitable for outdoor installation.

3 Unpacking

3.1 Scope of Delivery

Check the delivery for completeness and for any visible external damage. Contact your dealer if anything is damaged or missing.



Object	Quantity	Description
A	1	Inverter
B	1	Wall mounting bracket
C	2	Ventilation grid (1 x left, 1 x right)
D	5	Filler-plug for wall mounting (sealing)
E	2	Cheese-head screw (M6)
F	1	AC connection socket: bush insert, protective cap for bush insert, threaded sleeve, sealing ring, pressure screw
G	6	DC connectors (3 x positive, 3 x negative)*
H	6	Sealing plug for DC connectors
I	1	Jumper for communication / fan test
K	1	Installation manual
L	1	User manual
M	1	Document set with explanations and certificates
N	1	Supplementary sheet with inverter default settings

* For WB 3300-11 / WB 3800-11 2 x positive, 2 x negative

3.2 Identifying the Inverter

You can identify the inverter by means of the type label. The type label is located on the right-hand side of the enclosure.

On the type label you will find the type (Type / Model) and the serial number (Serial No.) of the inverter.

4 Assembly

4.1 Safety

**DANGER!****Danger to life due to fire or explosion**

Despite careful construction, electrical devices can cause fires.

- Do not mount the inverter on flammable construction materials.
- Do not mount the inverter in areas where highly flammable materials are stored.
- Do not mount the inverter in a potentially explosive atmosphere.

**CAUTION!****Risk of burns due to hot enclosure parts**

- Do not touch the enclosure during operation.

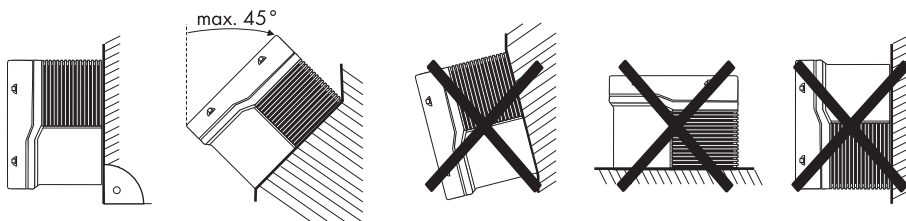
**CAUTION!****Risk of injury due to the heavy weight of the inverter.**

- Bear in mind that the inverter weighs approx. 38 kg

4.2 Selecting the Mounting Location

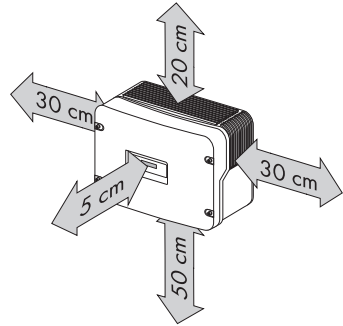
Observe the following conditions for mounting:

- The mounting method and location must be suitable for the weight and size of the inverter.
- Mount on a solid surface.
- The mounting location must be clear and safely accessible at all times without the use of additional aids such as scaffolding or lifting platforms. Non-fulfillment of these criteria may restrict service friendliness.



- Mount vertically or tilted backwards by max. 45°.
- Never mount the device with a forward tilt.
- Never mount the device with a sideways tilt.
- Do not mount in a horizontal position.
- The connection area must point downwards.
- Mount at eye level so that operation states can be read.
- The ambient temperature should be below 40°C to ensure optimum operation.
- Do not expose the inverter to direct solar irradiation as this can cause over-heating and hence power reduction.
- To avoid audible vibrations in living areas, do not mount the unit on plasterboard walls or similar. The inverter can make noises when in use which may be perceived as a nuisance in living areas.

- Observe minimum clearances to walls, other inverters or objects as shown in the diagram in order to guarantee adequate heat dissipation.

**Multiple inverters installed in areas with high ambient temperatures**

If necessary, increase the spacing between the individual inverters. In addition, make sure there is an adequate fresh-air supply to ensure sufficient cooling of the inverters.

4.3 Mounting the Inverter using the Wall Mounting Bracket

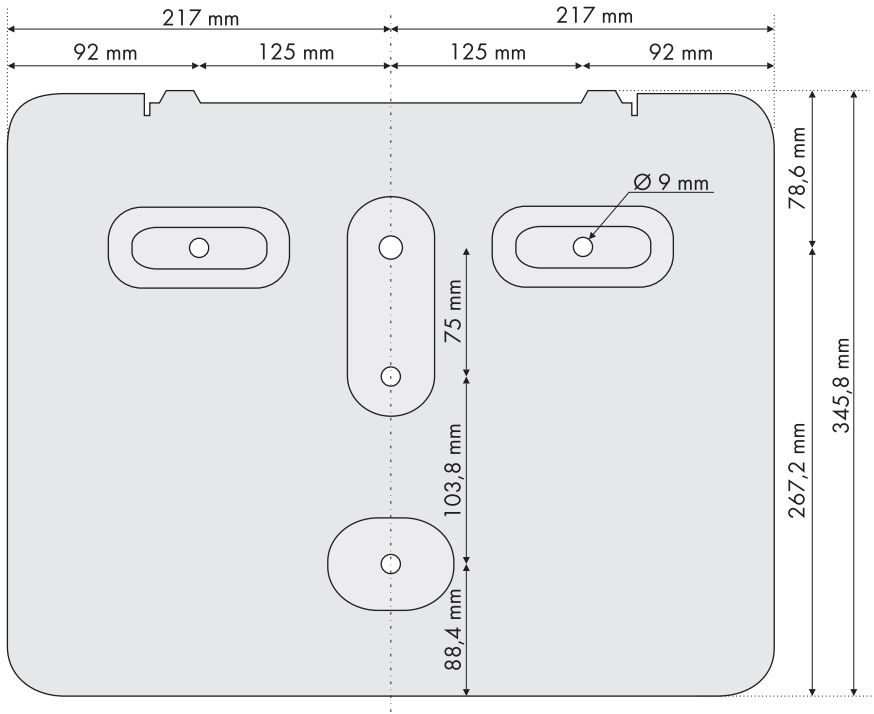


CAUTION!

Risk of injury due to the heavy weight of the inverter.

- Bear in mind that the inverter weighs approx. 38 kg

1. Use the wall mounting bracket as a drilling template and mark the positions of the drill holes.

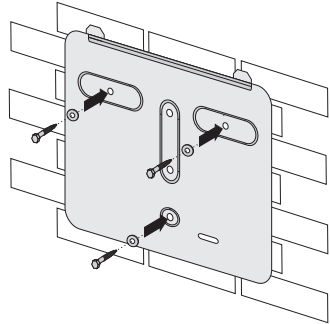


Mounting material

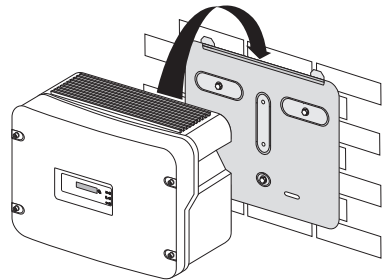
When mounting the wall mounting bracket, use fastening material suitable for the mounting surface.

2. Use filler-plugs to fill any unused holes in the wall mounting bracket. Insert the filler-plugs into the wall mounting bracket from the outside (the side that will later be placed against the wall).

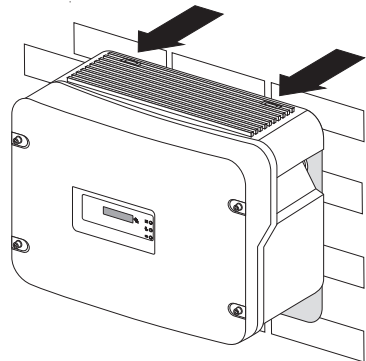
3. Attach the wall mounting bracket to the wall using suitable screws and washers.



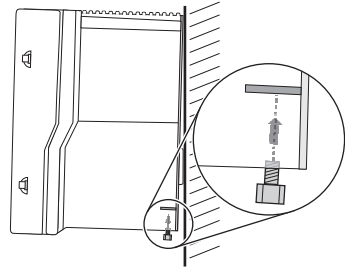
4. Hook the inverter by its top mounting plates into the wall mounting bracket with both attachments of the wall bracket passing through the cutouts on the inverter.



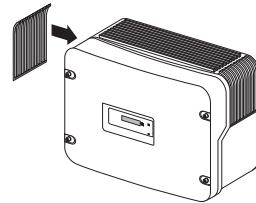
5. Visual inspection: The inverter is only correctly mounted when both rear panel attachments slightly protrude through the cutouts.



6. Secure the inverter in position by screwing the supplied M6 contact screw into the underside of the enclosure. Use the contact washer provided with the tothing facing towards the enclosure. Tighten the screw with a torque of approx. 5 Nm.




7. Check to ensure that the inverter is securely in place. The wall mounting bracket is designed in such way that the inverter is tilted slightly backwards on a perfectly vertical wall.
8. Attach the ventilation grids provided to the inverter. To help you identify the sides, "links/left" or "rechts/right" is printed on the inside of the ventilation grids.



- ☒ The inverter is now mounted.

5 Electrical Connection

5.1 Safety



NOTICE!

Electrostatic discharge can damage the inverter

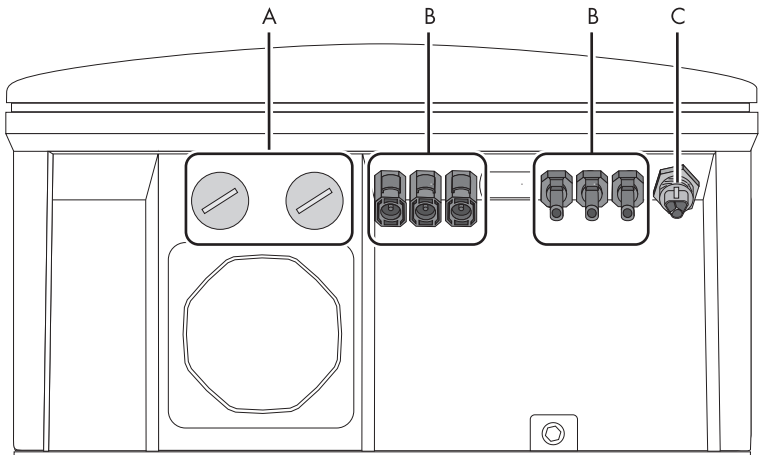
Internal components of the inverter can be irreparably damaged by electrostatic discharge.

- Earth yourself before touching a component.

5.2 Overview of the Connection Area

5.2.1 Exterior View

The following figure shows the assignment of the individual connection areas on the underside of the inverter.

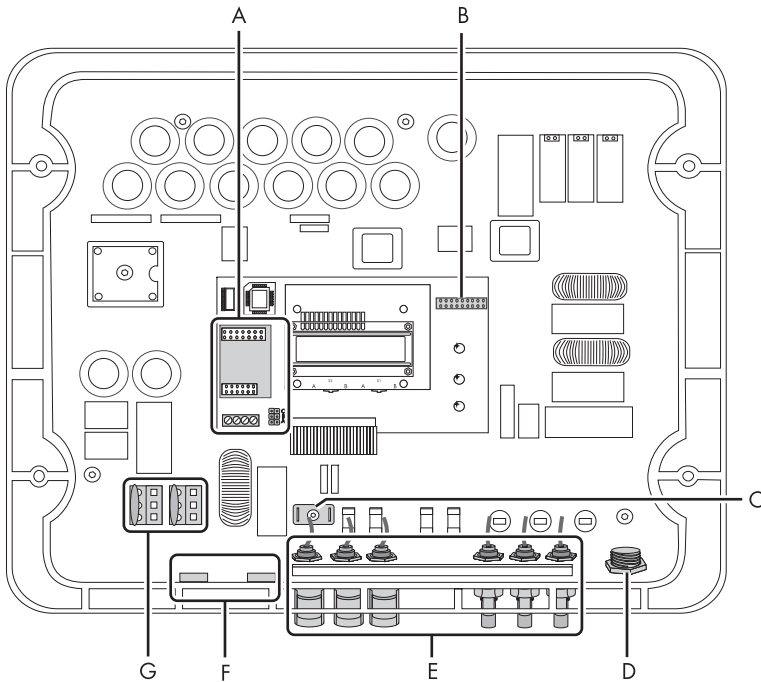


Object	Description
A	Enclosure openings for communication (with filler-plugs)
B	DC connectors for connecting the DC cables*
C	AC socket for grid connection

* For WB 3300-11 / WB 3800-11, the inverter is fitted with 2 negative and 2 positive DC connectors.

5.2.2 Interior view

The following figure shows the various components and connection areas of the open inverter.



Object	Description
A	Slot and connection area for communication
B	Jumper slot for fan test
C	Flat male tab for earthing the cable shield with cable-bound communication
D	AC socket for grid connection
E	DC connector for connecting the small wind turbine system *
F	Enclosure opening with filler-plugs for communication
G	Varistors

* For WB 3300-11 / WB 3800-11, the inverter is fitted with 2 negative and 2 positive DC connectors.

5.3 Connection to the Electricity Grid (AC)

5.3.1 Conditions for AC Connection



Connection requirements of the network operator

Always comply with the connection requirements of your network operator.

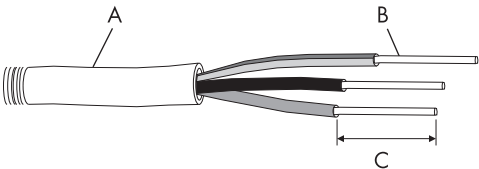
Cable sizing

Use Sunny Design Version 2.0 or higher for sizing the conductor cross-sections (see Sunny Design program at www.SMA.de/en).

The maximum cable lengths as a function of conductor cross-section are shown in the following table.

Cable cross-section	Maximum cable length	
	WB 3300 / WB 3300-11 / WB 3300-IT	WB 3800 / WB 3800-11 / WB 3800-IT
4 mm ²	18.5 m	16 m

Cable requirements



Object	Description	Value
A	External diameter	6 mm ... 14 mm
B	Conductor cross-section	4 mm ²
C	Stripping length	8 mm

Load disconnect unit

You must install a separate miniature circuit-breaker for each inverter in order to ensure that the inverter can be securely disconnected under load. The maximum permissible fuse protection can be found in Section 11 "Technical Data" (page 69).

Detailed information and examples on the design of miniature circuit-breakers are available in the Technical Information "Miniature circuit-breakers" to be found in the download area of SMA Solar Technology AG at www.SMA.de/en.



DANGER!

Danger to life by fire.

When more than 1 inverter is connected in parallel to the same miniature circuit-breaker, the protective function of the miniature circuit-breaker is no longer guaranteed. It can result in a cable fire or destruction of the inverter.

- Never connect several inverters to the same miniature circuit-breaker.
- Observe the maximum permissible fuse protection of the inverter when selecting the miniature circuit-breaker.

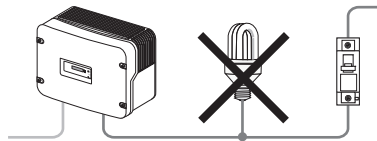


DANGER!

Danger to life by fire.

When a generator (inverter) and a load are connected to the same miniature circuit-breaker, the protective function of the miniature circuit-breaker is no longer guaranteed. The currents from the inverter and the grid can accumulate to form overcurrents that are not detected by the miniature circuit-breaker.

- Never connect the load between the inverter and the miniature circuit-breaker without protection.
- Always protect the load separately.



NOTICE!

Damage to the inverter due to use of screw-type fuses as load disconnection units

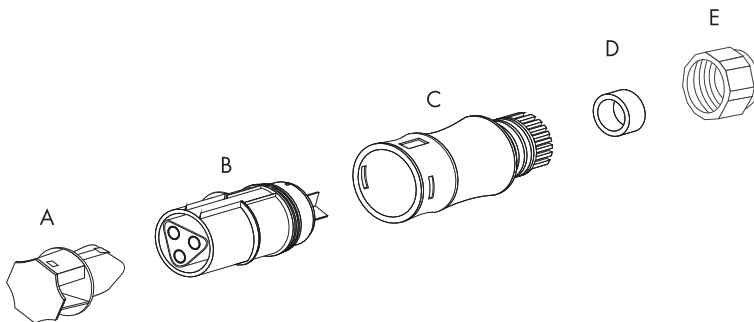
A screw-type fuse, e.g. DIAZED fuse or NEOZED fuse, is not a switch-disconnector and thus may not be used as a load disconnection unit. A screw-type fuse only acts as cable protection.

Disconnection under load using a screw-type fuse may damage the inverter.

- Use only a switch-disconnector or a miniature circuit-breaker as a load disconnection unit.

5.3.2 Connecting the Inverter to the Electricity Grid (AC)

Overview of the AC connection socket



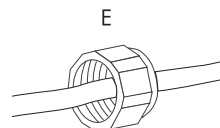
Object	Description
A	Protective cap for bush insert
B	Bush insert
C	Threaded sleeve with sealing ring for cable diameters from 10 mm ... 14 mm
D	Sealing ring for cable cross-section from 6 mm ... 10 mm
E	Pressure screw

Procedure

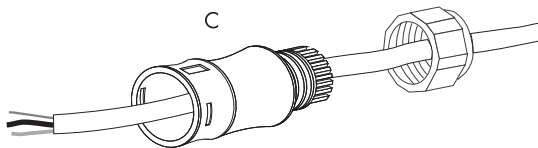
1. Check that the line voltage is within the permissible voltage range.

The exact operating range of the inverter is specified in the operating parameters. The relevant document can be found in the download area at www.SMA.de/en, in the "Technical Description" category of the respective inverter.

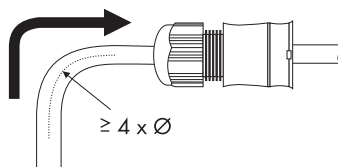
2. Disconnect the miniature circuit-breaker and secure against accidental or inadvertent reconnection.
3. If necessary, replace the sealing ring of the threaded sleeve with the sealing ring provided.
 - Pull the sealing ring out of the threaded sleeve.
 - Insert the smaller sealing ring.
4. Pass the pressure screw (E) over the AC cable.



5. Pass the threaded sleeve (C) with the sealing ring over the AC cable.

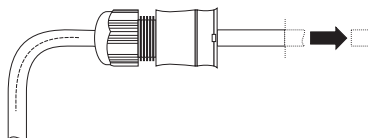


6. Bend the AC cable. The bending radius must be at least four times the cable diameter.

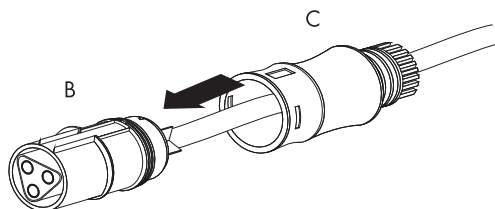
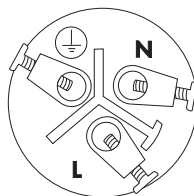


7. Shorten the cable.

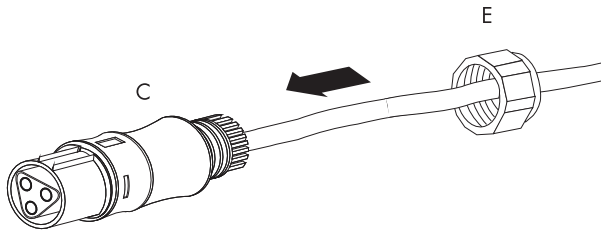
8. Shorten phase L and neutral conductor N 4 to 5 mm.



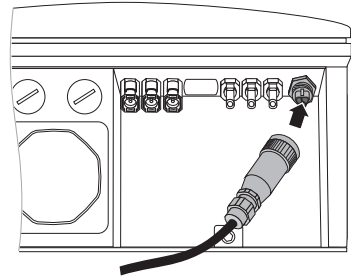
9. Insert the PE conductor (green-yellow) into the screw terminal with the earth sign on the bush insert and tighten the screw. The PE conductor must be longer than the connection wires N and L.
10. Insert neutral conductor N (blue) into screw terminal N on the bush insert and tighten the screw.
11. Insert phase L (brown or black) into screw terminal L on the bush insert and tighten the screw.
12. Check that the connection wires are securely connected.
13. Push the threaded sleeve (C) onto the bush insert (B) until it audibly snaps into place.



14. Screw the pressure screw (E) tightly onto the threaded sleeve (C). The pressure screw acts as a seal and to relieve strain.



- ☑ The AC connection socket is now assembled.
15. Close the bush insert with the protective cap provided if the inverter is not to be connected immediately.
 16. Insert the AC connection socket into the AC socket on the inverter. If necessary, remove the protective cap beforehand.

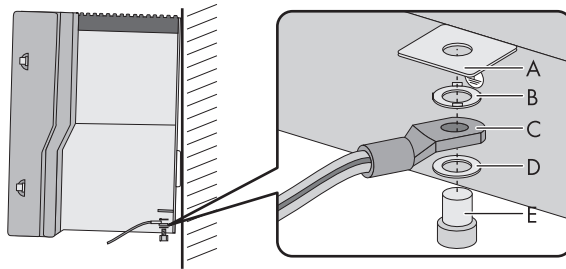


- ☑ The AC cable is now connected to the inverter.

5.3.3 Connecting Additional Earthing

If a second protective conductor, additional earthing or equipotential bonding is required, you can also earth the inverter on the enclosure.

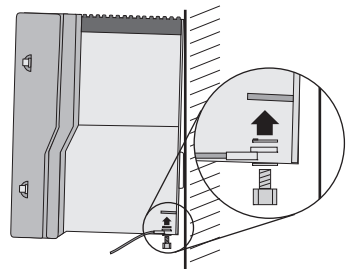
Overview of additional earthing



Object	Description
A	Metal bracket on the bottom of the inverter enclosure
B	Conical spring washer (included in delivery)
C	Terminal lug (M6) with protective conductor
D	Washer
E	M6x12 cheese-head screw (included in delivery)

Procedure

1. Disconnect the inverter on the AC and DC side as described in Section 7.2 "Opening the Inverter" (page 48).
2. Align washer, terminal lug with protective conductor and conical spring washer on cheese-head screw. The teeth of the conical spring washer must be facing the metal bracket.
3. Insert the cheese-head screw into the metal bracket and tighten to a torque of 6 Nm.



4. Check that the contact between the protective conductor and the enclosure is in accordance with the regulations valid in the country of installation.

5.4 Setting the Display Language

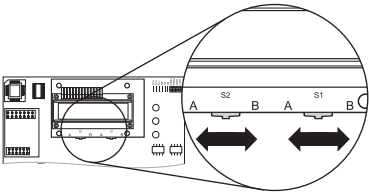
You can set the display language using the rotary switches on the underside of the display assembly inside the inverter.

For inverters configured to the Italian country standard DK 5940, different switch positions apply. You can see the standard to which the inverter was set upon delivery on the type label and on the included supplementary sheet with the default settings. For more information, see the Technical Description "Operating Parameters" at www.SMA.de/en.

Procedure

- 1. Open the inverter as described in Section 7.2 "Opening the Inverter" (page 48).
- 2. Set the switch to the appropriate language. The following switch settings apply to all national standards except for DK 5940:

Language	Rotary switch S2	Rotary switch S1
German	B	B
English	B	A
French	A	B
Spanish	A	A



The following switch settings apply to inverters that are set to the Italian national standard DK 5940:

Language	Rotary switch S2	Rotary switch S1
Italian	B	A
English	A	A

- 3. Close the inverter as described in Section 7.3 "Closing the Inverter" (page 50).
- ☒ The display language is now set.

5.5 Connecting the Small Wind Turbine System (DC)

5.5.1 Conditions for DC connection

- The connection cables of the small wind turbine system must be fitted with connectors. The DC connectors for the DC connection are included in the delivery.
- The following limit values must not be exceeded at the DC input of the inverter:

Maximum input voltage	Maximum input current
500 V	20 A



DANGER!

Risk of lethal electric shock or fire

The maximum possible input current is limited by the connectors used. If the connectors are overloaded, an electric arc may occur, thus causing a fire risk.

- Ensure that the input current does not exceed the maximum through-fault current of the connectors used.



NOTICE!

Destruction of the inverter due to overvoltage

If the voltage of the small wind turbine system exceeds the maximum input voltage of the inverter, the inverter can be destroyed by overvoltage. This will void all warranty claims.

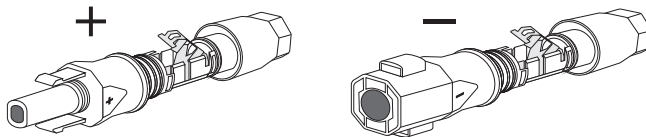
- Install overvoltage protection, e.g. Windy Boy Protection Box, between the small wind turbine system and the inverter.

5.5.2 Assembling the DC Connectors

For connection to the inverter, all connection cables of the small wind turbine system must be fitted with the supplied DC connectors.

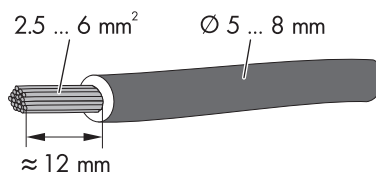
Assemble the DC connectors as follows. Ensure the connectors have the correct polarity.

The DC connectors are marked with the symbols "+" and "–".



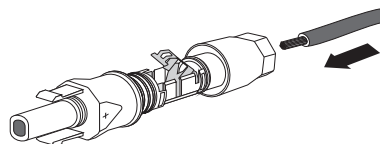
Cable requirements

- Use a PV1-F cable.

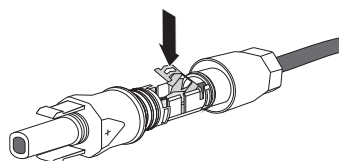


Procedure

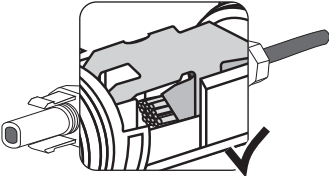
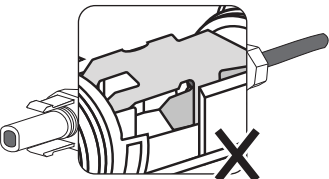
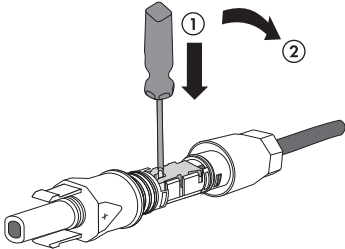
1. Insert the stripped cable into the plug up to the stop.



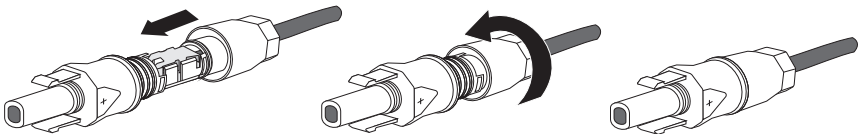
2. Press the clamping bracket down until it audibly snaps into place.



3. Ensure that the cable is correctly positioned:

Result	What to do
<p>✓ If the stranded wire is visible in the chamber of the clamping bracket, the cable is correctly positioned.</p> 	<ul style="list-style-type: none"> Proceed to step 4.
<p>✓ If the stranded wire is not visible in the chamber, the cable is not correctly positioned.</p> 	<ul style="list-style-type: none"> Release the clamping bracket. Do this by inserting a screwdriver (blade width: 3.5 mm) into the clamping bracket to lever it open.  <ul style="list-style-type: none"> Remove the cable and go back to step 1.

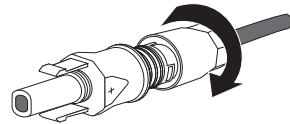
4. Push the cable gland up to the thread and fasten to a torque of 2 Nm.



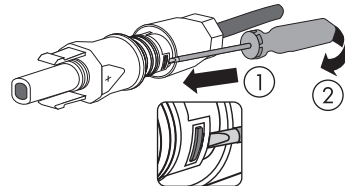
- ✓ The DC connectors are now assembled and can be connected to the inverter as described in Section 5.5.4 "Connecting the Small Wind Turbine System (DC)" (page 34).

5.5.3 Opening DC Connectors

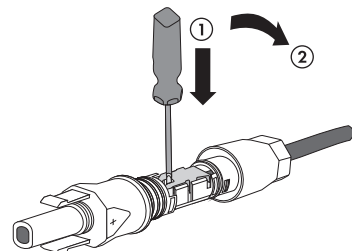
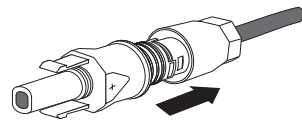
1. Unscrew the cable gland.
2. Release the DC connector. To do so, insert a screwdriver (blade width: 3.5 mm) into the lateral catch and lever it open.



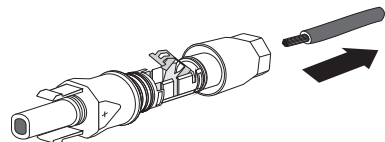
3. Carefully pull the DC connector apart.



4. Release the clamping bracket. Do this by inserting a screwdriver (blade width: 3.5 mm) into the clamping bracket to lever it open.



5. Remove the cable.



- ☒ The cable is now detached from the DC connector.

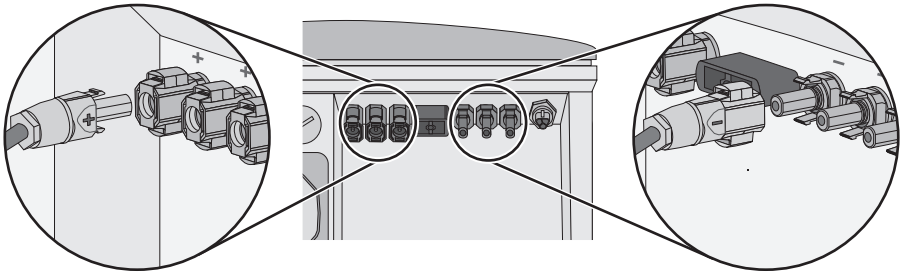
5.5.4 Connecting the Small Wind Turbine System (DC)

**DANGER!**

Danger to life due to high voltages in the inverter

- Before connecting the small wind turbine system, ensure that it is not running.

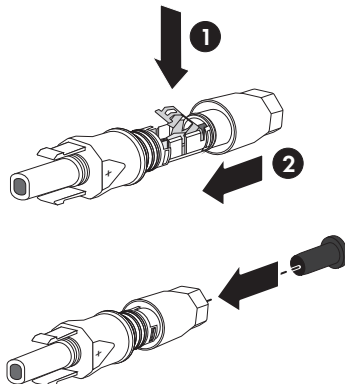
1. Connect the assembled DC connectors to the inverter.
 - ☑ The DC connectors click audibly into position.
To release the DC connectors, see Section 7.2 "Opening the Inverter" (page 48).



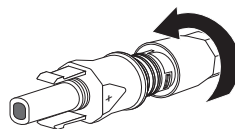
**NOTICE!****Risk of damage to the inverter by moisture penetration**

The inverter is only properly sealed when all the unused DC inputs are closed with DC plug connectors and sealing plugs:

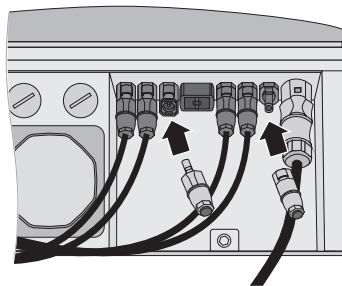
- **DO NOT** insert the sealing plugs **DIRECTLY** into the DC inputs on the inverter.
- For unused DC plug connectors, push down the clamping bracket and push the swivel nut up to the thread.



- Insert the sealing plug into the DC connector.
- Tighten the DC connector (torque: 2 Nm).



- Insert the DC plug connectors with sealing plugs into the corresponding DC inputs on the inverter.
- ☑ The DC connectors click audibly into position.



2. Ensure that all DC connectors are securely in place.
- ☑ The small wind turbine system is now connected.

You can now commission the inverter as described in Section 6 "Commissioning" (page 39). The following connections are optional.

5.6 Communication

The inverter is equipped with a slot for communication interfaces which enable it to communicate with data loggers (e.g., Sunny WebBox) or a PC with appropriate software (e.g., Sunny Explorer).

Refer to the communication interface manual for a detailed wiring diagram and installation instructions.

The inverter's active power can be limited or the displacement power factor $\cos \varphi$ can be set externally using the Power Reducer Box by SMA Solar Technology AG. You will find detailed information on active power limitation and on setting the displacement power factor $\cos \varphi$ in the technical description "Operating Parameters" at www.SMA.de/en.

5.7 Setting the Grid and Country Parameters



Changing grid-relevant parameters and country parameters

To change grid-relevant parameters, you need a personal access code – the so-called SMA Grid Guard code. The application form for the personal access code is available in the download area at www.SMA.de/en, in the "Certificate" category of the respective inverter.

Confirm the changes to these parameters with your network operator.

A detailed description of the operating parameters for the inverter is available in the download area at www.SMA.de/en in the category "Technical Description" of the respective inverter.

5.7.1 Setting the Installation Country

Using the "Default" parameter, you can set the country of installation and/or the grid connection standard valid for that country via a communication product (e.g., Sunny WebBox) or a PC with corresponding software (e.g., Sunny Data Control or Sunny Explorer). However, this is only required if the inverter was originally ordered for another country. You can see the standard to which the inverter was set upon delivery on the type label and on the included supplementary sheet with the default settings.

5.7.2 Setting to Stand-alone Grid Operation

To operate the inverter in an stand-alone system with Sunny Island, you must set the inverter via the "Default" parameter to stand-alone grid operation ("OFF-Grid").

There are several ways of setting the inverter to stand-alone grid operation:

- Setting via Sunny WebBox
or
- Setting via Sunny Data Control or Sunny Explorer



DANGER!

Danger to life due to high voltages in the event of electricity grid failure

If you set the inverter to stand-alone grid operation, it does not fulfil any country-specific standards or guidelines. If grid failure occurs, there will consequently be a danger of backfeed.

- Never operate the inverter directly on the electricity grid when set to stand-alone grid operation.

5.8 Polynomial Curve

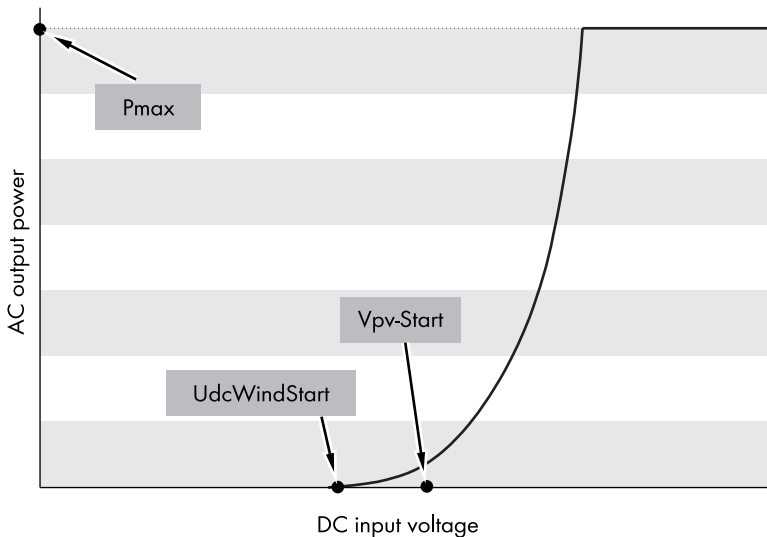
The polynomial curve is a programmable power curve which is dependent on the DC input voltage. By adapting the default polynomial curve to the small wind turbine system being used, you can optimise the energy output of the system.

To adapt the polynomial curve of the inverter to the wind turbine system being used, you can change the following parameters on the PC with the "Windy Boy Setup Tool" (www.SMA.de/en):

- V_{pv-Start}
- U_{dcWindStart}
- Wind_a0 ... Wind_a3
- P_{max}
- P-Wind-Ramp
- KP-Wind-Reg
- KI-Wind-Reg
- T-Stop

A description of the operating parameters is available in the download area at www.SMA.de/en in the category "Technical Description" of the respective inverter.

The inverter regulates its output power according to the generator voltage. The following diagram shows the function of a typical polynomial curve in a WB 3300 / WB 3300-11 / WB 3800 / WB 3800-11. Here, the AC power fed in is depicted as a function of the DC input voltage of the inverter.

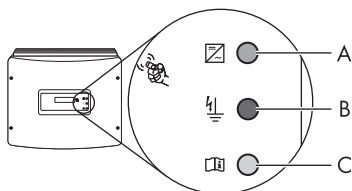


6 Commissioning

6.1 Commissioning the Inverter

1. Check the following requirements before commissioning:
 - Correct mounting and connection of the inverter.
 - Appropriately sized miniature circuit-breaker.
 - Correct earthing of the small wind turbine system in accordance with the instructions of the manufacturer.
 - The rectifier and overvoltage protection (e.g. Windy Boy Protection Box) are installed between the small wind turbine system and the inverter.
 - Unused DC inputs are closed with the corresponding DC connectors and sealing plugs
 2. Switch on the miniature circuit-breaker.
 3. Commission the small wind turbine system in accordance with the instructions of the manufacturer.
 - ☒ All 3 LEDs on or flashing: the start-up phase commences.
 - ☒ Green LED on: commissioning successful.
- or**
- ☒ Green LED flashing: grid connection conditions have not yet been reached. Wait until the green LED is permanently on.
- or**
- ☒ The red or yellow LED lights up or flashes: a disturbance has occurred. Proceed to step 3.

Object	Description
A	Green LED: operation
B	Red LED: earth fault or varistor defective
C	Yellow LED: disturbance



Self-test in accordance with DK 5940, Ed. 2.2 during initial start-up (applies to Italy only)

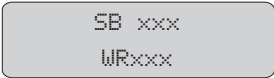
The Italian DK 5940 standard prescribes that an inverter can only operate on the electricity grid if the disconnection times for overvoltage, undervoltage, minimum frequency and maximum frequency have been checked.

Start the self-test as described in Section 6.3 "Self-Test in Accordance with DK 5940, Ed. 2.2 (Applies to Italy Only)" (page 41). The test takes approx. 8 minutes.

4. Read Section 9 "Troubleshooting" (page 56) and if necessary eliminate the fault or disturbance.

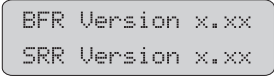
6.2 Display Messages During the Start-up Phase

- After commissioning, the inverter displays the device type in the start-up phase.



SB xxx
WRxxx

- After 5 seconds or a further tap on the enclosure lid, the inverter displays the firmware version of the internal processors.
- After a further 5 seconds or another tap, the inverter displays the configured country standard (example: "VDE-AR-N4105").



BFR Version x.xx
SRR Version x.xx



VDE-AR-N4105



Show display messages again (valid from Firmware Version 4.00)

If you want to view the display messages of the start-up phase again during operation, tap the enclosure lid twice in quick succession.

6.3 Self-Test in Accordance with DK 5940, Ed. 2.2 (Applies to Italy Only)

6.3.1 Starting the Self-Test by Tapping

You can start the check of the disconnection times by tapping on the enclosure lid. The prerequisite for this is that the inverter country setting has been set to Italy (IT/DK5940) or "trimmed". Proceed as follows for checking the disconnection times:

1. Connect the small wind turbine system to the inverter. The inverter can only initialise once the small wind turbine system is producing enough power.
2. Connect the inverter on the AC side. To do this, you have to make the AC connection (AC plug or direct connection) and switch on the circuit-breaker of the grid feed cable (fuse or miniature circuit-breaker).
3. The inverter is now in the initialisation phase, i.e. all three LEDs are simultaneously on.

Start the self-test **immediately** after all three LEDs have gone out by tapping on the display of the inverter.

4. The display queries whether you would like to start the test sequence. Tap on the display again within 30 seconds to confirm.

A rectangular display screen with a light gray background and a thin black border. The text 'Avvio Autotest' is displayed on the top line, and a question mark '?' is displayed on the bottom line, both in a black, monospaced font.

Once you have started the test sequence, the inverter successively checks the disconnection times for overvoltage, undervoltage, maximum frequency and minimum frequency. During the tests, the values described in Section 6.3.2 "Completion of the Self-test" (page 42) appear in the display.

6.3.2 Completion of the Self-test

Note the values which are displayed during the self-test. These values must be entered in a test report. The test results of the individual tests are displayed three times in succession. Each display message appears for 10 seconds.

During the self-test, the upper and lower disconnection thresholds for each protective function are subject to linear adjustment with a modification of 0.05 Hz/s and 0.05 Vn/s for the frequency and voltage monitoring. As soon as the actual measured value exceeds the permitted range (adjusted disconnection threshold), the inverter disconnects from the electricity grid. In this way, the inverter determines the reaction time and the self-test is performed.

Overvoltage test

The inverter begins with the overvoltage test. During the test sequence, the voltage limit applied is shown in the display of the inverter.

The voltage is reduced step by step until the disconnection threshold is reached and the inverter disconnects from the electricity grid.

Once the inverter has disconnected from the electricity grid, the display alternates between the following values:

- Disconnection value,
- Calibration value,
- Reaction time,
- Current line voltage.

```
Autotest
Uac max:      262.00V
```

```
Valore di soglia
con:          229.95V
```

```
Val. taratura
              262.00V
```

```
Tempo intervento
              0.08s
```

```
Tensione di rete
Val.eff.:     230.00V
```

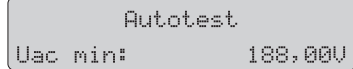
Undervoltage test

After the overvoltage test, the inverter performs the undervoltage test. During the test sequence, the current calibration value of the voltage limit applied is shown in the display of the inverter.

The voltage is increased step by step until the disconnection threshold is reached and the inverter disconnects from the electricity grid.

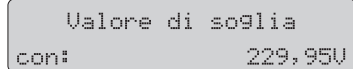
Once the inverter has disconnected from the electricity grid, the display alternates between the following values:

- Disconnection value,



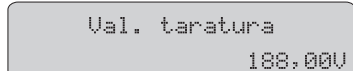
Autotest
Uac min: 188,00V

- Calibration value,



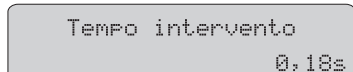
Valore di soglia
con: 229,95V

- Reaction time,

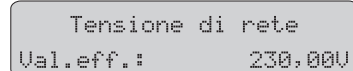


Val. taratura
188,00V

- Current line voltage.



Tempo intervento
0,18s



Tensione di rete
Val.eff.: 230,00V

Maximum frequency

In the third step, the inverter tests the maximum frequency. During the test sequence, the frequency limit applied is shown in the display of the inverter.

The frequency is reduced step by step until the disconnection threshold is reached and the inverter disconnects from the electricity grid.

Once the inverter has disconnected from the electricity grid, the display alternates between the following values:

- Disconnection value,

```
Autotest
Fac max:      50,30Hz
```

- Calibration value,

```
Valore di soglia
con:          49,95Hz
```

- Reaction time,

```
Val. taratura
              50,29Hz
```

- Current power frequency.

```
Tempo intervento
              0,08s
```

```
Frequenza rete
Val.eff.:     50,00Hz
```

Minimum frequency

Finally, the inverter tests the minimum frequency. During the test sequence, the frequency limit applied is shown in the display of the inverter.

The frequency is increased step by step until the disconnection threshold is reached and the inverter disconnects from the electricity grid.

Once the inverter has disconnected from the electricity grid, the display alternates between the following values:

- Disconnection value,

```
Autotest
Fac min:      49,70Hz
```

- Calibration value,

```
Valore di soglia
con:          50,05Hz
```

- Reaction time,

```
Val. taratura
              49,71Hz
```

- Current power frequency.

```
Tempo intervento
              0,08s
```

```
Frequenza rete
Val.eff.:     50,00Hz
```

Once the inverter has carried out all four tests, it switches to the "Turbine Mode". The original calibration values are then reset and the inverter automatically connects to the electricity grid. If you wish to carry out the test again, you must switch off the inverter, i.e. disconnect it on the AC and DC sides, and then restart it. You can then restart the self-test as described in Section 6.3.1 "Starting the Self-Test by Tapping" (page 41). The inverter restarts the test sequence as described in Section 6.3.2 "Completion of the Self-test" (page 42).

6.4 Operating States of the Inverter

Start-Up Procedure

Providing that the inverter is supplied with sufficient voltage and power, the three LEDs on the inverter light up simultaneously, indicating that the start-up process is ongoing.

As soon as the DC input voltage reaches the value configured for the parameter "Vpv-Start", the inverter triggers several self-tests, measuring procedures and synchronization with the electricity grid. This operating state is indicated on the inverter by the flashing green LED.

Once the DC input voltage has reached the "Vpv-Start" value for the time configured in "T-Start" and all the tests have been completed successfully, the inverter connects to the electricity grid and the green LED comes on permanently. The inverter then switches to characteristic-curve operation, and regulates the input current according to the generator voltage.

Characteristic-Curve Operation

After the start-up procedure, the inverter switches to characteristic-curve operation and regulates the input current according to the generator voltage.

The inverter then begins to exert a load on the small wind turbine system, draws power from the system according to the input voltage present, and then feeds it into the electricity grid. The maximum power output corresponds to the maximum AC power of the inverter. However, this can be reduced via the "Pmax" parameter.

Shutdown Procedure

If wind strength is so low that the DC input voltage falls below an internally calculated value, the inverter stops feeding energy to the electricity grid for the period defined in "T-Stop". As soon as DC input voltage increases again, the inverter switches back to characteristic-curve operation.

If the DC input voltage remains below an internally calculated value for the time set in "T-Stop", the inverter will switch off.

If the DC input voltage is no longer sufficient to supply the on-board electronics with power, the inverter switches off immediately.

7 Opening and Closing

7.1 Safety

**DANGER!**

Electric shock due to high voltages in the inverter. This can result in death or serious burns.

Before opening the inverter, observe the following:

- Ensure that no voltage is present on the AC side.
- Ensure that neither voltage nor current is present on the DC side.

**NOTICE!**

Electrostatic discharge can damage the inverter

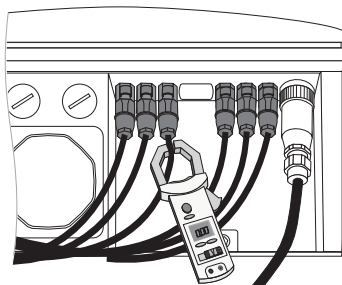
The internal components of the inverter can be irreparably damaged by electrostatic discharge.

- Earth yourself before touching any components inside the inverter.

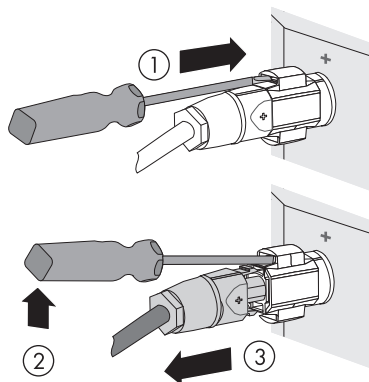
7.2 Opening the Inverter

1. Stop the small wind turbine system and secure against restarting.
2. Disconnect the miniature circuit-breaker and secure against accidental or inadvertent reconnection.
3. Use a current probe to make sure that no current is present in the DC cables.

☑ If current is present, check the installation.



4. Release and disconnect all DC connectors. To do this, insert a flat-blade screwdriver (blade width: 3.5 mm) into one of the side slots and pull the DC plug connectors straight out. Take care **NOT TO PULL ON THE CABLE**.

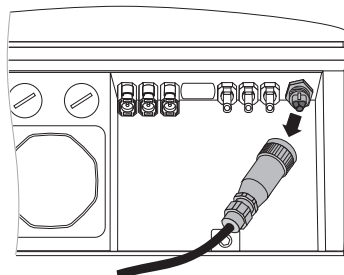


☑ All DC connectors are now disconnected from the inverter. The inverter is completely disconnected from the small wind turbine system.

5. Ensure that no voltage is present at the DC connectors on the inverter.

☑ If voltage is present, check the installation.

6. Pull out the AC plug.



7. Check whether all LEDs and the display have gone out.

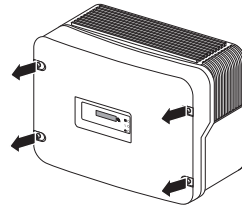
**DANGER!**

Danger to life due to high voltages in the inverter

The capacitors in the inverter take 15 minutes to discharge.

- Wait 15 minutes before opening the inverter.

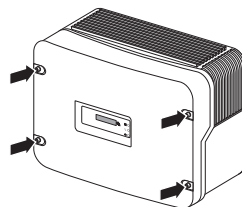
8. Loosen the screws of the enclosure lid.
9. Slowly pull the enclosure lid forward and off.



- ☒ The inverter is now open and de-energised.

7.3 Closing the Inverter

1. Attach the enclosure lid using the 4 screws and the conical spring washers with the tothing facing toward the enclosure lid. The screws must be tightened with approximately 6 Nm torque to ensure that the enclosure is sealed and the lid properly earthed.



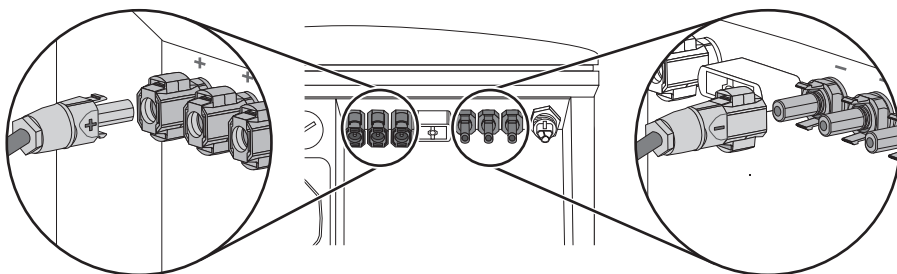
DANGER!

Danger to life due to live enclosure lid

The earthing of the lid is effected by the conical spring washers.

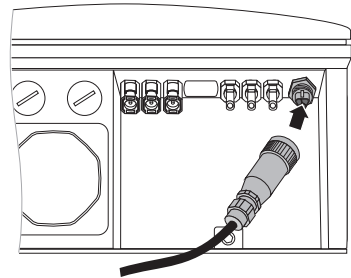
- Attach the conical spring washers for all screws with the tothing facing toward the enclosure lid.

2. Check the DC connectors for correct polarity and plug them in.
To release the DC connectors see Section 7.2 "Opening the Inverter" (page 48).
☒ The DC connectors click audibly into position. To release the DC connectors, see Section 7.2 "Opening the Inverter" (page 48).

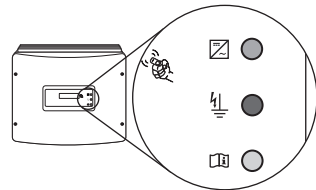


3. Close all unused DC inputs as described in Section 5.5.4 "Connecting the Small Wind Turbine System (DC)" (page 34) to ensure that the inverter is properly sealed.
4. Ensure that all DC connectors are securely in place.

5. Connect the AC plug.



6. Switch on the miniature circuit-breaker.
7. Check whether the inverter display and LEDs indicate a normal operating state (see Section 6 "Commissioning" (page 39)).



- ☒ The inverter is now closed and in operation.

8 Maintenance and cleaning

8.1 Cleaning the Inverter



NOTICE!

Damage to the display by use of cleaning agents

- If the inverter is dirty, clean the enclosure lid, the display and the LEDs with clear water and a cloth only.

8.2 Checking Heat Dissipation

You only need to check the heat dissipation of the inverter if a visual inspection reveals a marked clogging of the fan guard or the inverter frequently goes into the "Derating" operating state. The ambient temperature and cooling efficiency determines whether the inverter switches to "Derating".

8.2.1 Cleaning the Fans

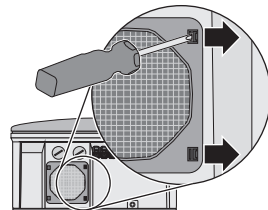
If the fan guard is only covered in loose dust, it can be cleaned with a vacuum cleaner. If you do not achieve satisfactory results with a vacuum cleaner, dismantle the fans for cleaning.

Proceed as follows:

1. Disconnect the inverter on both the DC and AC sides as described in Section 7.2 "Opening the Inverter" (page 48).
2. Wait for the fan to stop rotating.

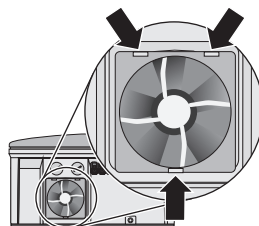
Cleaning the fan guards

3. To dismantle the fan guard:
 - Use a screwdriver to press both latches at the right edge of the fan guard to the right and dislodge it from the retainer.
 - Carefully remove the fan guard.
4. Clean the fan guard with a soft brush, a paint brush, a cloth or compressed air.



Cleaning the Fans

5. Press the two upper latches towards the rear and the lower latch towards the front.
6. Remove the fan by pulling it slowly and carefully downwards.



7. Release and pull out the fan plug inside the inverter.
The fan cables are long enough to let you lift the fan out sufficiently to disconnect the internal plugs in the inverter.
8. Remove the fan.
9. Clean the fan with a soft brush, a paint brush, or a damp cloth.



NOTICE!

Damage to the fan through use of compressed air

- Do not use compressed air to clean the fan. The fan could be damaged as a result.

10. After cleaning, reassemble everything in reverse order.
11. Check fan operation, as described in the following section.

8.2.2 Checking the Fans

There are two ways to check whether the fan is working:

- Set the "Fan Test" parameter to "1" in the installer mode using Sunny Data Control, Sunny Explorer or Sunny WebBox.

or

- Plug the provided jumper into the system control board.

Setting Parameters

1. Request an installer password from the SMA Service Line (contact see page 77).
2. Set the "Fan Test" parameter to "1" in the installer mode.
3. Check the air-flow of the fan.

The inverter draws air in from underneath and blows it out at the top left. Listen for any unusual noise that could indicate incorrect installation or that the fan is defective.

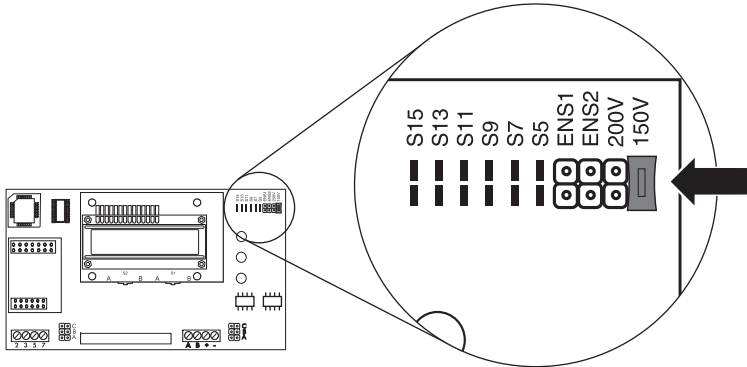
4. After checking the fan, set the "Fan Test" parameter back to "0".

- ☒ The fan test is now completed.

Plugging the Jumper

The inverter recognizes the jumper only after a system restart (i.e. all LEDs must have gone out prior to restart).

1. Open the inverter as described in Section 7.2 "Opening the Inverter" (page 48).
2. Plug the provided jumper in the slot on the system control board as shown below.



3. Close the inverter as described in Section 7.3 "Closing the Inverter" (page 50).
4. Restart the inverter.
5. Check the air-flow of the fan.

The inverter draws air in from underneath and blows it out at the top left. Listen for any unusual noise that could indicate incorrect installation or that the fan is defective.

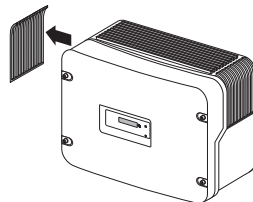
6. Remove the jumper. Open and close the inverter as described in Section 7 "Opening and Closing" (page 47).
- ☒ The fan test is now completed.

8.2.3 Cleaning the Ventilation Grids

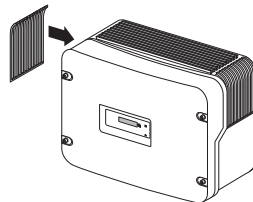
There are ventilation grids on each side of the inverter. The inverter takes cooling air in from underneath via the fan and blows it out again through the ventilation grids on the upper left side. To ensure adequate heat dissipation of the inverter, you only need to clean the left ventilation grid.

Procedure

1. Remove the left ventilation grid.
Insert your finger in the space between the ventilation grid and the upper part of the enclosure and remove the ventilation grid laterally.



2. Clean the ventilation grid with a soft brush, a paint brush or compressed air.
3. Re-attach the ventilation grid to the inverter.
To help you identify the sides, the ventilation grids are marked on the inside with "rechts/right" and "links/left".



- ☒ Cleaning of the ventilation grids is now complete.



NOTICE!

Risk of damage to the inverter through intrusion of insects.

- The ventilation grids must not be removed permanently, because otherwise the device will not be protected against the intrusion of insects.

9 Troubleshooting

If the inverter displays blink codes which differ from those described below, contact the SMA Service Line.

You will find a description of display messages during operation, status messages and measurement channels in the user manual provided.

Do not try to carry out any repairs other than those described here. Instead, use SMA Solar Technology AG's 24-hour replacement service (the inverter will be ready for dispatch at the freight forwarder within 24 hours) and repair service.

9.1 Blink Codes

Green	Red	Yellow	Status
flashing	flashing	flashing	OK (start-up phase)
permanently on	off	off	OK (feed-in operation)
	permanently on	off	Earth fault or varistor defective
		permanently on	OK (initialisation)
flashing rapidly (3 x per second)	off	off	OK (stop)
	permanently on	off	Earth fault or varistor defective
flashing slowly (1 x per second)	off	off	OK (waiting, grid monitoring)
goes off briefly (approx. 1 x per second)	off	off	OK (derating)
	permanently on	off	Earth fault or varistor defective
off	off	off	OK
		on / flashing	Disturbance
	permanently on	off	Earth fault or varistor defective
		on / flashing	Earth fault or varistor defective and disturbance

9.2 Error Messages

When a disturbance occurs, the inverter generates a message depending on the operating mode and the type of disturbance detected.

Message	Description / Remedial Action
!PV-Overvoltage! !DISCONNECT DC!	<p>DC Overvoltage</p> <p>Disconnect the small wind turbine system from the inverter immediately.</p> <ol style="list-style-type: none"> 1. Stop the small wind turbine system. 2. Disconnect the miniature circuit-breaker. 3. Disconnect the DC connectors. 4. Check the DC voltage: <ul style="list-style-type: none"> - If the DC voltage is above the maximum input voltage, check the plant design. - If the DC voltage is below the maximum input voltage, reconnect the small wind turbine system to the inverter as described in Section 5.5.4 "Connecting the Small Wind Turbine System (DC)" (page 34). <p>If the message is repeated, disconnect the inverter again and contact the SMA Service Line.</p>
ACVtgRPro	<p>The 10-minute-average line voltage is no longer within the permissible range. This can be caused by one of the following:</p> <ul style="list-style-type: none"> • The line voltage at the termination point is too high. • The grid impedance at the termination point is too high. <p>The inverter disconnects to assure compliance with the power quality of the electricity grid.</p> <ul style="list-style-type: none"> • Check the line voltage at the termination point of the inverter: <ul style="list-style-type: none"> - If, due to the local grid conditions, the line voltage is 253 V or more, ask the network operator whether the voltage at the feed-in point can be adjusted, or whether they will accept an adjustment of the limiting value of parameter "ACVtgRPro" for power quality monitoring. - If the line voltage is permanently within the tolerance range and this error message is still displayed, contact the SMA Service Line.
Bfr-Srr	<p>Internal measurement comparison fault or hardware defect.</p> <ul style="list-style-type: none"> • Contact the SMA Service Line if this disturbance occurs frequently.

Message	Description / Remedial Action
Derating	<p>The "Derating" operating state is a normal operating state which may occur occasionally and can have several causes.</p> <p>Once the inverter enters the "Derating" operating state, it will display the "Derating" warning until the next total shutdown of the device (when there is not enough wind).</p> <ul style="list-style-type: none"> Check the heat dissipation as described in Section 8.2 "Checking Heat Dissipation" (page 52).
dZac-Bfr dZac-Srr	<p>Sudden changes in grid impedance are outside the permissible range ("Bfr" or "Srr" are internal messages of no relevance for the user).</p> <p>The inverter disconnects from the electricity grid for safety reasons.</p> <ul style="list-style-type: none"> Check grid impedance and observe how often major deviations occur. <ul style="list-style-type: none"> If repeated frequency fluctuations occur and this is causing "dZac-Bfr" or "dZac-Srr" disturbances, ask the network operator to agree to a modification of the operating parameters (dZac-Max). Discuss any changes to the operating parameter with the SMA Service Line.
EEPROM	<p>Transitional disturbance while data is being written to or read from EEPROM. The data has no relevance to safe operation.</p> <ul style="list-style-type: none"> This disturbance has no effect on the performance of the inverter.
EEPROM dBh	<p>EEPROM data is defective, the inverter has switched off because the loss of data has disabled important functions of the inverter.</p> <ul style="list-style-type: none"> Contact the SMA Service Line.
EeRestore	<p>One of the duplicate records in the EEPROM is defective and has been restored without loss of data.</p> <ul style="list-style-type: none"> This error message is only for information purposes and has no effect on the performance of the inverter.
Fac-Bfr Fac-Srr FacFast	<p>The power frequency is no longer within the permissible range ("Bfr" or "Srr" is an internal message of no relevance for the user). The inverter disconnects from the electricity grid for safety reasons.</p> <ul style="list-style-type: none"> If the power frequency is within the tolerance range and the faults "Fac-Bfr", "Fac-Srr" or "FacFast" are displayed frequently, contact the SMA Service Line.
Imax	<p>Overcurrent on the AC side. This message is displayed when the current on the AC grid is greater than specified.</p> <ul style="list-style-type: none"> Check the system design and grid conditions.

Message	Description / Remedial Action
K1-Close K1-Open	Error during relay test. <ul style="list-style-type: none"> Contact the SMA Service Line if this disturbance occurs frequently or several times in a row.
MSD-Zac MSD-Vac MSD-Timeout MSD-Zac	Internal measurement comparison fault or hardware defect. <ul style="list-style-type: none"> Contact the SMA Service Line if this disturbance occurs frequently.
Offset	The "Offset" operating state is a normal operating state that occurs prior to grid monitoring. If "Offset" is displayed as an error, there is a disturbance in data logging. <ul style="list-style-type: none"> Contact the SMA Service Line if this disturbance occurs frequently.
Riso	The electrical insulation between the small wind turbine system and earth is faulty. The resistance between the DC plus and/or DC minus connection and earth is outside the defined limit range. <ul style="list-style-type: none"> Check the insulation of the small wind turbine system. Check the small wind turbine system for earth faults as described in Section 9.3.1 "Checking the Small Wind Turbine System for Earth Faults" (page 62).
ROM	The inverter firmware is faulty. <ul style="list-style-type: none"> Contact the SMA Service Line if this disturbance occurs frequently.
Shutdown	Temporary inverter disturbance. <ul style="list-style-type: none"> Contact the SMA Service Line.
Trafo-Temp-F	Temperatures in the transformer have exceeded the permissible limit. The inverter stops feeding into the grid until the temperature reverts to within the permissible range. <ul style="list-style-type: none"> If this problem recurs, check the heat dissipation of the inverter, as described in Section 8.2 "Checking Heat Dissipation" (page 52).
Trafo-Temp-W	If the transformer reaches an unacceptably high temperature, the inverter stops feeding energy to the grid until the temperature has reverted to normal and the system can begin feeding into the grid again. The "Trafo-Temp-W" warning is displayed until the device is completely disconnected. <ul style="list-style-type: none"> Check the heat dissipation as described in Section 8.2 "Checking Heat Dissipation" (page 52).

Message	Description / Remedial Action
Vac-Bfr Vac-Srr	<p>The line voltage is no longer within the permissible range ("Bfr" or "Srr" is an internal message of no relevance for the user). This disturbance can be caused by any of the following conditions:</p> <ul style="list-style-type: none"> • Grid disconnected (miniature circuit-breaker, fuse), • AC cable is interrupted or • AC cable is highly resistive. <p>The inverter disconnects from the electricity grid for safety reasons.</p> <ul style="list-style-type: none"> • Check the line voltage and grid connection on the inverter. • If the line voltage is outside the permissible range because of local grid conditions, ask the network operator if the voltages can be adjusted at the feed-in point or if they will accept adjustments to the values of the monitored operating limits (operating parameters: Vac-Min and Vac-Max). • If the line voltage is within the tolerance range, yet "Vac-Bfr" or "Vac-Srr" faults are still displayed, contact the SMA Service Line.
VpvMax Vpv-Max	<p>Overvoltage at the DC input. This could damage the inverter.</p> <p>Disconnect the small wind turbine system from the inverter immediately.</p> <ol style="list-style-type: none"> 1. Stop the small wind turbine system. 2. Disconnect the miniature circuit-breaker. 3. Remove all DC connectors. 4. Check the DC voltage: <ul style="list-style-type: none"> - If the DC voltage is above the maximum input voltage, check the plant design. - If the DC voltage is below the maximum input voltage, reconnect the small wind turbine system to the inverter as described in Section 5.5.4 "Connecting the Small Wind Turbine System (DC)" (page 34). <p>If the message is repeated, disconnect the inverter again and contact the SMA Service Line.</p>
Watchdog Watchdog Srr	<p>Internal disturbance of the program sequence.</p> <ul style="list-style-type: none"> • Contact the SMA Service Line if this disturbance occurs frequently.

Message	Description / Remedial Action
Zac-Bfr Zac-Srr	<p>The grid impedance is outside the permissible range. The suffixes "Bfr" und "Srr" are not relevant.</p> <p>The inverter disconnects from the electricity grid for safety reasons. The impedance is made up of both the grid impedance and the impedance of the inverter AC cables.</p> <ul style="list-style-type: none"> • Check the grid impedance and grid connection at the inverter. • Use an AC cable with an adequate cross-section (= low impedance) as described in Section 5.3.2 "Connecting the Inverter to the Electricity Grid (AC)" (page 25). If required, check and re-tighten the screws on the AC plugs. • Check the grid impedance and the AC connection on the inverter. Use a cable with an adequate cross-section (= low impedance). Observe the relevant advice in Section 5.3 "Connection to the Electricity Grid (AC)" (page 23). • If this fault recurs, please contact the SMA Service Line.

9.3 Red LED is Permanently On

If the red LED is permanently on during operation, this points either to an earth fault in the system or at least one of the overvoltage protection varistors being defective.

In deliberately earthed systems, the red LED lights up as soon as the inverter has been commissioned. However, this has no impact on the function of the inverter. Before you check the small wind turbine system for an earth fault, check whether deliberate earthing has been carried out.

In deliberately earthed small wind turbine systems, check from time to time that the varistors in the inverter are working properly, since a varistor fault can no longer be displayed.

9.3.1 Checking the Small Wind Turbine System for Earth Faults



DANGER!

Danger to life due to high voltages in the inverter

- Stop the small wind turbine system and secure against restarting.
- Disconnect the miniature circuit-breaker and secure against accidental or inadvertent reconnection.

1. Wait until LEDs have gone out.



DANGER!

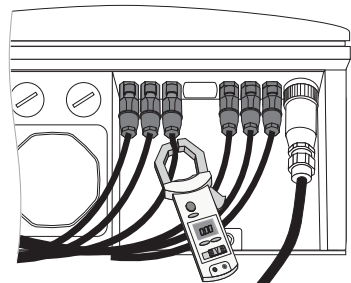
Danger to life due to high voltages in the inverter

The capacitors in the inverter take 15 minutes to discharge.

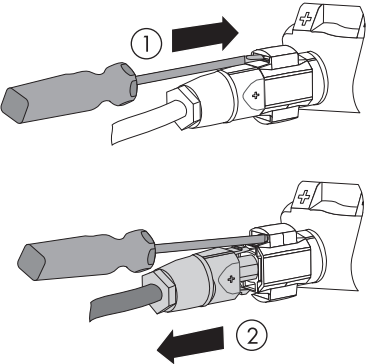
- Wait 15 minutes before opening the inverter.

2. Use a current probe to make sure no current is present in the DC cables.

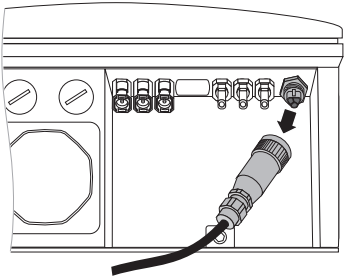
☒ If current is present, check the installation.



3. Release and disconnect all DC connectors. To do this, insert a flat-blade screwdriver (blade width: 3.5 mm) into one of the side slots and pull the DC plug connectors out. Take care **NOT TO PULL ON THE CABLE**.



4. Remove the AC connection socket from the inverter.



5. Disconnect L1, L2 and L3 of the small wind turbine system from the Windy Boy Protection Box.
6. Measure the resistance between the phases of the small wind turbine system and the earth potential:
- Measure the resistance between L1 of the small wind turbine system and the earth potential.
 - Measure the resistance between L2 of the small wind turbine system and the earth potential.
 - Measure the resistance between L3 of the small wind turbine system and the earth potential.

Result	What to do
<p>The measured resistance is virtually infinite.</p> <p>☑ There is no earth fault in the small wind turbine system.</p>	<p>There is probably an earth fault in the Windy Boy Protection Box or in the supply cables to the inverter.</p> <ul style="list-style-type: none">• Disconnect the Windy Boy Protection Box from the inverter and measure the resistance of all connections and the earth potential.

Result	What to do
<p>The measured resistance is very small ($< 10 \Omega$).</p> <p><input checked="" type="checkbox"/> There is an earth fault in the small wind turbine system.</p>	<ul style="list-style-type: none">• Have the installer of the small wind turbine system eliminate the earth fault before reconnecting the system to the inverter.

9.3.2 Checking the Function of the Varistors

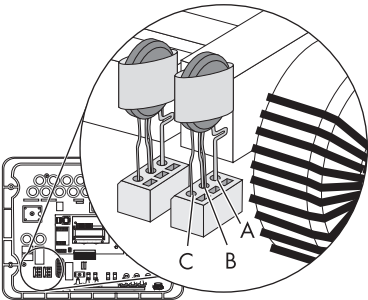
Varistors are wear parts. Their functional efficiency diminishes with age or repeated strain as a result of overvoltages. It is therefore possible that one of the thermally monitored varistors has lost its protective function.



Position of the varistors

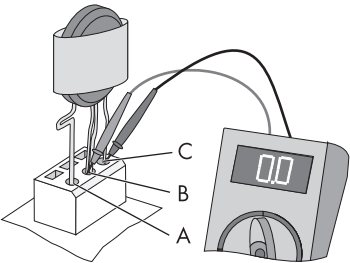
The position of the varistors can be located with the help of the diagram below. Note the following assignment of the terminals:

- Terminal A: outer terminal (varistor connection **with crimp**)
- Terminal B: middle terminal
- Terminal C: outer terminal (varistor connection **without crimp**)



You can check the function of the varistors as follows:

1. Open the inverter as described in Section 7.2 "Opening the Inverter" (page 48).
2. Use a multimeter to check that in each of the installed varistors there is a conductive connection between terminals B and C.



Result	What to do
There is a conductive connection.	There is presumably a different error in the inverter. <ol style="list-style-type: none">1. Close the inverter as described in Section 7.3 "Closing the Inverter" (page 50).2. Contact the SMA Service Line.

Result	What to do
There is no conductive connection.	<p>The respective varistor is defective and must be replaced.</p> <p>Varistor failure is generally due to influences that affect all varistors in a similar manner (temperature, age, induced overvoltage). SMA Solar Technology AG recommends that you replace both varistors.</p> <p>The varistors are specially manufactured for use in the inverter and are not commercially available. You must order replacement varistors directly from SMA Solar Technology AG (see Section 13 "Contact" (page 77)).</p> <ul style="list-style-type: none"> For the replacement of the varistors, proceed to step 3.



NOTICE!

Inverter overvoltage due to faulty varistors. Destruction of the inverter due to overvoltage

- Procure replacement varistors immediately and replace the defective varistors.
- In systems with a high risk of overvoltage, do **not** operate inverters with faulty varistors or no varistors at all.

- Insert the special insertion tool into the openings of the terminal contacts (1).

☒ This releases the terminals.

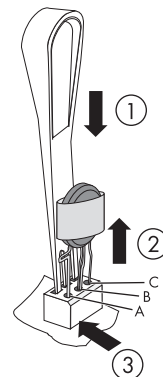
If you have not received an insertion tool to operate the terminals together with the replacement varistors, contact SMA Solar Technology AG. Alternatively, the individual terminal contacts can be operated using a screwdriver with blade width 3.5 mm.

- Remove the varistor (2).
- Insert the new varistor (3).

When installing the new varistor, the pole with the small loop (crimp) must be mounted in terminal A (3).

- Close the inverter as described in Section 7.3 "Closing the Inverter" (page 50).

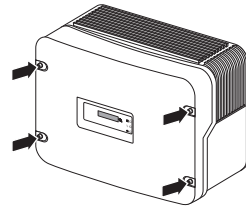
☒ Testing and replacement of the varistors is now complete.



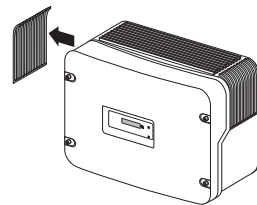
10 Decommissioning

10.1 Dismantling the Inverter

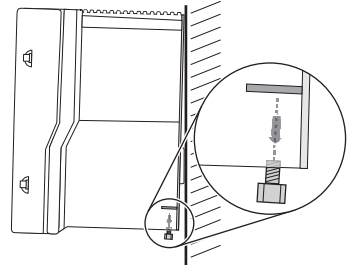
1. Open the enclosure lid as described in Section 7.2 "Opening the Inverter" (page 48).
2. Remove all cables from the inverter.
3. Close the inverter with the 4 screws and the corresponding conical spring washers.



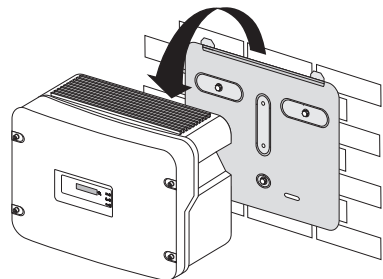
4. Remove the ventilation grids on either side.



5. Remove the screw attaching the product to the wall mounting bracket.



6. Remove the inverter from the wall mounting bracket by lifting it vertically upwards.



- ☒ The inverter is now dismantled.

10.2 Packing the Inverter

If possible, always pack the inverter in its original packaging. If this is no longer available, you can also use an equivalent box. The box must be completely closeable and suitable for the weight and size of the inverter.

10.3 Storing the Inverter

Store the inverter in a dry place where ambient temperatures are always between -25°C and $+60^{\circ}\text{C}$.

10.4 Disposing of the inverter

Dispose of the inverter at the end of its service life in accordance with the disposal regulations for electronic waste which apply at the installation site at that time. Alternatively, send it back to SMA Solar Technology AG with shipping paid by sender, and labelled "ZUR ENTSORGUNG" ("For Disposal") (see Section 13 "Contact" (page 77)).

11 Technical Data

11.1 DC/AC

11.1.1 Windy Boy 3300

DC input

Turbine control	Polynomial Curve
Maximum DC power at $\cos \varphi = 1$	3 820 W
Recommended generator power at 2 500 full-load hours per year	3 100 W
Recommended generator power at 5 000 full-load hours per year	2 800 W
Maximum input voltage	500 V
DC voltage range	200 V ... 500 V
Rated input voltage	200 V
Minimum input voltage	200 V
Start input voltage	250 V
Maximum input current	20 A
Maximum input current per string	16 A
Number of independent DC inputs	1
Strings per MPP input*	3

* For WB 3300-11 / WB 3800-11: 2 strings per MPP input

AC output

Rated power at 230 V, 50 Hz	3 300 W
Maximum apparent AC power	3 600 VA
Rated line voltage	230 V
AC nominal voltage	220 V / 230 V / 240 V
AC voltage range	180 V ... 265 V
Nominal AC current at 220 V	15 A
Nominal AC current at 230 V	14.3 A
Nominal AC current at 240 V	13.8 A
Maximum output current	18 A
Total harmonic factor of the output current at total harmonic factor of the AC voltage < 2%, and AC power > 50% rated power	≤ 3 %
Rated power frequency	50 Hz
AC power frequency	50 Hz / 60 Hz
Operating range at AC power frequency 50 Hz	+5 Hz / – 6 Hz
Operating range at AC power frequency 60 Hz	+5 Hz / – 6 Hz
Displacement power factor, adjustable*	0.8 _{overexcited} ... 0.8 _{underexcited}
Power factor at nominal AC power**	1
Feed-in phases	1
Connection phases	1
Overvoltage category according to IEC 60664-1	III

* for WB 3300-11

** for WB 3300/WB 3300-IT

Efficiency

Maximum efficiency, η_{\max}	95.2%
European weighted efficiency, η_{EU}	94.4%

11.1.2 Windy Boy 3800

DC input

Turbine control	Polynomial Curve
Maximum DC power at $\cos \varphi = 1$	4 040 W
Recommended generator power at 2 500 full-load hours per year	3 600 W
Recommended generator power at 5 000 full-load hours per year	3 300 W
Maximum input voltage	500 V
DC voltage range	200 V ... 500 V
Rated input voltage	200 V
Minimum input voltage	200 V
Start input voltage	250 V
Maximum input current	20 A
Maximum input current per string	20 A
Number of independent DC inputs	1
Strings per MPP input*	3

* For WB 3300-11 / WB 3800-11: 2 strings per MPP input

AC output

Rated power at 230 V, 50 Hz	3 800 W
Maximum apparent AC power	3 800 VA
Rated line voltage	230 V
AC nominal voltage	220 V / 230 V / 240 V
AC voltage range	180 V ... 265 V
Nominal AC current at 220 V	17.3 A
Nominal AC current at 230 V	16.5 A
Nominal AC current at 240 V	15.8 A
Maximum output current	18 A
Total harmonic factor of the output current at total harmonic factor of the AC voltage < 2%, and AC power > 50% rated power	≤ 3 %
Rated power frequency	50 Hz
AC power frequency	50 Hz / 60 Hz
Operating range at AC power frequency 50 Hz	+/- 4.5 Hz
Operating range at AC power frequency 60 Hz	+/- 4.5 Hz
Displacement power factor, adjustable*	0.8 _{overexcited} ... 0.8 _{underexcited}
Power factor at nominal AC power**	1
Feed-in phases	1
Connection phases	1
Overvoltage category according to IEC 60664-1	III

* for WB 3800-11

** for WB 3800/WB 3800-T

Efficiency

Maximum efficiency, η_{\max}	95.6%
European weighted efficiency, η_{EU}	94.7%

11.2 General data

Width x height x depth	450 mm x 350 mm x 236 mm
Weight	38 kg
Length x width x height of packaging	580 mm x 470 mm x 390 mm
Transport weight	43.7 kg
Climatic category (according to IEC 60721-2-1)	4K4H
Operating temperature range	– 25 °C ... +60 °C
Maximum permissible value for relative humidity, non-condensing	100%
Maximum operating altitude above Mean Sea Level	2 000 m
Noise emission (typical)	≤ 42 dB(A)
Power loss in night operation	0.10 W
Topology	LF transformer
Cooling concept	OptiCool: temperature-controlled fan
Fan connection	designed for safe disconnection in accordance with DIN EN 50178:1998-04
Electronics protection rating according to IEC 60529	IP65
Protection class (according to IEC 62103)	I

11.3 Protective Devices

DC reverse polarity protection	Short-circuit diode
Input-side disconnection device	Electronic Solar Switch
DC overvoltage protection	Thermally monitored varistors
AC short-circuit current strength	Current control
Grid monitoring	SMA Grid Guard X
Maximum permissible fuse protection	25 A
Earth fault monitoring	Insulation monitoring: $R_{iso} > 1 \text{ M}\Omega$
Galvanic isolation	Available

11.4 Licences

Country standard, as per 12/2011	WB 3300	WB 3300-IT	WB 3300-11	WB 3800	WB 3800-IT	WB 3800-11
VDE0126-1-1	✓	-	✓	✓	-	✓
VDE-AR-N 4105	-	-	✓	-	-	✓
VDE0126-1-1 / UTE C15-712-1	-	-	✓	-	-	✓
UTE C15-712-1 / EDF SEI req.	✓	-	-	✓	-	-
DK5940	-	✓	-	-	✓	-
PPC	✓	-	-	✓	-	-
RD 1663/2000	✓	-	-	✓	-	-
RD 661/2007	✓	-	-	✓	-	-
AS 4777	✓	-	-	✓	-	-
G83/1-1	✓	-	-	✓	-	-
EN 50438*	✓	-	-	✓	-	-
C10/11	✓	-	-	✓	-	-

* EN 50438: not applicable to all deviations from the national standard

11.5 Climatic Conditions

According to IEC 60721-3-4, installation type C, class 4K4H

Extended temperature range	- 25°C ... +60°C
Extended humidity range	0% ... 100%
Extended air pressure range	79.5 kPa ... 106 kPa

According to IEC 60721-3-2, transport type E, class 2K3

Temperature range	- 25°C ... +70°C
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11.6 Features

DC connection	SUNCLIX DC connector
AC connection	AC connector
Display	LC text display
Bluetooth® Wireless Technology	Optional
RS485, galvanically isolated	Optional

11.7 Torques

Enclosure lid screws	6.0 Nm
Additional earthing screw	6.0 Nm
Cheese-head screw for attaching enclosure to wall mounting bracket	6.0 Nm
SUNCLIX swivel nut	2.0 Nm
RS485 communication connection	1.5 Nm

11.8 Distribution systems

IT system	suitable
TN-C system	suitable
TN-S system	suitable
TN-C-S system	suitable
TT system	suitable
Split-phase	suitable

12 Accessories

You will find the accessories and spare parts corresponding to your specific inverter in the following overview. If required, you can order these from SMA Solar Technology AG or your dealer.

Designation	Brief description	SMA order number
Windy Boy Protection Box	Rectifier and overvoltage protection for small wind turbine systems with Windy Boy	WBP-Box 500
Ventilation grid	Ventilation grid set "right and left" as spare parts	45-7202
Replacement varistors	Set of thermally controlled varistors (2 pcs.) including insertion tool	SB-TV 4
Insertion tool for replacement of varistors	Insertion tool for varistors	SB-TVWZ
RS485 retrofit kit	RS485 communication interface	485PB-NR
Bluetooth® Wireless Technology retrofit kit	Bluetooth communication interface	BTPBINV-NR
SUNCLIX DC plug connector	Field plug for conductor cross-sections 2.5 mm² ... 6 mm²	SUNCLIX-FC6-SET

13 Contact

If you have technical problems concerning our products, contact the SMA Service Line. We require the following information in order to provide you with the necessary assistance:

- Inverter type
- Inverter serial number
- Type of connected small wind turbine system
- Optional equipment, e.g. communication products
- Blink code or display message of the inverter

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